- Traffic Flow Over Time for the First 10 Sensors (96 Time Steps, 1 Day):
  - **Key Patterns and Trends**:
    - **Daily Traffic Pattern:** All sensors show a clear daily pattern, with traffic flow gradually increasing in the early morning, peaking around midday, and then declining toward the evening. This pattern aligns with typical daily traffic behavior, reflecting rush hour and lower activity periods.
    - **Variation Across Sensors:** Different sensors exhibit varying peak levels of traffic flow, indicating that some locations experience higher traffic volumes than others, likely due to their proximity to busy intersections or road sections.
    - **Consistent Peaks and Valleys**: The synchronous peaks and troughs across all sensors suggest a coordinated traffic pattern influenced by external factors like work start/end times and typical daily schedules.
    - **Noise and Fluctuations:** Some sensors, such as Sensor 1, show more pronounced fluctuations, suggesting variability in traffic that could be due to local conditions (e.g., traffic lights, roadworks, or nearby exits).
- Analysis of ACF and PACF with Different Lags (96 vs. 600) (1 Day vs 6.25 Days)
  - **ACF with 96 Lags (Displayed Image)**:
    - The ACF plot with 96 lags shows a gradual decrease in correlation with increasing lag, indicating significant seasonal or cyclic patterns within the first 96 intervals. This likely reflects daily traffic flow variations, capturing rush hour and other peak times.
    - The curve in the ACF plot dips into negative territory and then rises again, which suggests a cyclical pattern that could correspond to daily or other periodic traffic behaviors.
    - The PACF plot shows significant values at the initial lags, suggesting that recent time points are highly influential for forecasting, but the influence diminishes quickly.
  - **ACF with 600 Lags (Earlier Provided Image)**:
    - The ACF plot with 600 lags exhibits a strong, repeating sinusoidal pattern, indicating long-term seasonality. This suggests that the traffic flow is influenced not only by daily cycles but also by longer periodic trends (e.g., weekly or monthly patterns).

        - The recurring peaks and troughs in the ACF suggest regular intervals where traffic flow behavior repeats, which could be related to consistent weekly schedules or other longer-term patterns.
        - The PACF remains relatively flat beyond the initial lags, indicating that while the extended lags show periodic correlations, their direct impact when accounting for intermediate values is minimal.
    - **Comparison of 96 vs. 600 Lags**:
        - **Shorter Lags (96)**: This setting highlights short-term dependencies, likely capturing daily cycles and quick patterns within the data. It is useful for understanding immediate past influences on traffic flow, especially for models focused on short-term forecasting.
        - **Longer Lags (600)**: This reveals long-term correlations, showing more complex seasonality and periodic trends. It is valuable for identifying broader patterns such as weekly or monthly cycles, making it relevant for models that need to incorporate extended time dependencies.

- Scatter Plot of Feature 1 vs. Traffic Flow:
    - **Key Patterns and Trends**:
        - The scatter plot shows a non-linear relationship between the historical traffic volume (Feature 1) and current traffic flow.
        - There is a clear clustering pattern, suggesting distinct traffic flow behaviors that could correspond to different times of the day (e.g., peak vs. off-peak hours).
    - **Influence on Model Selection and Feature Engineering**:
        - The non-linear pattern suggests that linear models might not capture the relationship effectively; non-linear models like decision trees or neural networks may perform better.
        - Feature engineering could involve transforming or combining features to better capture the observed patterns, possibly by segmenting data by time of day or traffic conditions.

- Box Plot of Traffic Flow by Hour of the Day
    - **Key Patterns and Trends**:
        - This plot shows that traffic flow tends to peak during the early hours of the morning (around 1-3 AM) and remains relatively high until the late morning (10-11 AM). The traffic flow gradually decreases as the day progresses, reaching its lowest levels late at night.

- Violin Plot of Traffic Flow by Day of the Week
    - **Key Patterns and Trends**:
        - The traffic flow distribution appears relatively consistent across the week with slight variations. There are no significant spikes or dips, suggesting similar traffic behavior throughout the weekdays and weekends
    - **Influence on Model Selection and Feature Engineering**:
        - The identified patterns suggest the need to incorporate time-related features (hour of the day and day of the week) into the model to capture diurnal and weekly traffic flow variations.

- Histogram of Traffic Flow at Sensor 1
    - **Key Patterns and Trends**:
        - The histogram of traffic flow at Sensor 1 shows a bimodal distribution with two peaks, suggesting distinct periods of higher and lower traffic flow. The traffic flow values are clustered around 0.05 and 0.30, indicating variability in traffic conditions.
    - **Influence on Model Selection and Feature Engineering**:
        - Incorporating time-of-day features and external factors (e.g., weather, events) may help capture the distinct traffic flow patterns observed.